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(71)Applicant : KINSEKI LTD
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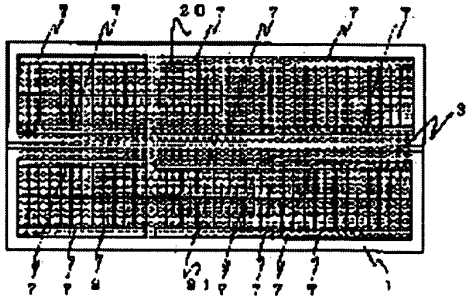
(54) SURFACE ACOUSTIC WAVE ELEMENT AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To simplify the frequency adjustment process of a surface acoustic wave element and to reduce the number of entire manufacturing processes by forming an SiO2 protection film to each single surface acoustic wave element sliced individually from a piezoelectric substrate wafer.

SOLUTION: An SiO2 protection film 3 is uniformly vapor-deposited to each surface acoustic wave element 2 formed on a piezoelectric wafer by using a photo-lithography technology and assembled via each process of dicing, dice bonding, and wire bonding through the use of the vapor-deposition technology of the electron beam radiation system employing a solid-state quartz block with a rotary mechanism for the vapor-deposition source. In the case of vapor- depositing the SiO2 protection film 3, an equivalent frequency to the film thickness of the SiO2 protection film 3 is utilized and managed in real time to adjust simultaneously the frequency of each surface acoustic wave element 2.



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CLAIMS

[Claim(s)]

[Claim 1] The surface acoustic element which irradiates an electron beam at the solid quartz block of a vacuum evaporationo crucible, and doubles with a predetermined frequency in the surface acoustic element which forms SiO2 protective coat in the front face of the surface acoustic element constituted on a piezo-electric substrate by vapor-depositing SiO2 protective coat on the surface of a surface acoustic element, and is characterized by the thing of a surface acoustic element for which SiO2 protective coat is formed in the polar zone at least.

[Claim 2] The surface acoustic element given in the 1st term of a patent claim characterized by carrying out frequency regulation to real time by adjusting the protective coat vacuum evaporationo thickness of this SiO2 protective coat.

[Claim 3] The manufacture approach of the process which forms an electrode in the surface acoustic element which forms SiO2 protective coat of the surface acoustic element which used photolithography and was formed on the piezo-

electric substrate wafer, the process which cuts this piezo-electric substrate wafer to a surface acoustic element separately, the process which carries out dice bonding to a container and which carries out wire bonding to it, and the surface acoustic element which consists of the process which forms SiO2 protective coat while supervising a frequency on this electrode.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] It is related with the frequency regulation of a surface acoustic element, and SiO2 protective-coat formation.
[0002]
[Description of the Prior Art] With the conventional technique, on the piezo-electric substrate, SiO2 was vapor-deposited for the surface acoustic element which consists of a Kushigata electrode and a reflector in the state of the piezo-electric substrate wafer, and the electrode protective coat of a surface acoustic element was formed. Moreover, after performing near adjustment per piezo-electric substrate wafer also in frequency regulation, fine frequency regulation

was performed in the phase which separated the surface acoustic element from the piezo-electric substrate wafer separately according to the property specification.

[0003]

[Problem(s) to be Solved by the Invention] However, if SiO2 protective-coat processing is performed in the state of a piezo-electric substrate wafer, since the fault wire-bonding processing becomes impossible for SiO2 protective coat will produce the wire-bonding connection part in the surface acoustic element in a subsequent production process, a wire-bonding part will require the device and time and effort of masking which does not perform SiO2 protective coat. On the other hand, it was carrying out batch processing of the frequency regulation near in the state of a piezo-electric substrate wafer in frequency regulation using dry etching processing, and it was difficult for frequency regulation and frequency measurement to carry out to real time, and it was expensive. Moreover, formation and frequency regulation of SiO2 protective coat needed to be performed at the respectively different process, and the thing much whose process, time amount, and time and effort are the need was the present condition.

[0004]

[Means for Solving the Problem] making an electron beam irradiate a solid quartz block, and vapor-depositing SiO2 -- a surface acoustic element -- SiO2 protective coat can be vapor-deposited to homogeneity at least at the polar zone. In the phase which separated the surface acoustic element separately, the electrode protective coat of the whole surface acoustic element surface can be formed by [of the surface acoustic element separated separately] giving SiO2 protective coat at least to the polar zone. Moreover, while forming an electrode protective coat, frequency regulation can perform a surface acoustic element on real time.

[0005]

[Background] Although SiO2 protective coat by SiO2 is given as a protective coat which protects the inter-electrode short-circuit by the heterogeneous object in the crossover finger of the Kushigata electrode section which constitutes a surface

acoustic element etc., SiO2 good protective coats, such as overall protective coat thickness, are required of the protective coat processing. Moreover, batch processing of this SiO2 protective-coat formation is carried out in the phase of a piezo-electric substrate wafer from the problem of the difficulty nature of workability. However, the device and time and effort that SiO2 protective-coat formation must be performed except for the wire-bonding connection place which can be set like an erector by performing SiO2 protective-coat formation processing in the phase of a piezo-electric substrate wafer are needed.

[0007] So, by this invention, by the former, it is in the condition which separated the SiO2 protective-coat formation which was carrying out batch processing in the state of the piezo-electric substrate wafer from the condition of a piezo-electric substrate wafer to each surface acoustic element by changing the vacuum evaporationo approach for SiO2 protective-coat formation, and a process is improved by [of the surface acoustic element of the appearance included in the container] vapor-depositing SiO2 protective coat to the polar zone (the Kushigata electrode, reflector electrode) at least.

[0008] SiO2 protective-coat processing of a surface acoustic element is performed by SiO2 crawled off by the vacuum evaporationo technique used by this invention supplying a solid quartz block to the rotating crucible, and irradiating an electron beam at the solid quartz block. By the conventional vacuum evaporationo approach, there is an advantage that SiO2 protective coat by which the source of vacuum evaporationo supplied to a crucible was vapor-deposited by the technique of this invention from the thing which there is almost no presentation change by aging of the source of vacuum evaporationo, and is the need, and for which only a complement can be vapor-deposited by the way although the presentation of the source of vacuum evaporationo will change with aging is very good.

[0009] On the other hand, generally also in frequency regulation, batch processing was performed by the dry etching of a piezo-electric substrate wafer unit. However, when frequency regulation was performed per piezo-electric

substrate wafer, the process of the variation in the frequency regulation in a part for a core and the edge of a piezo-electric substrate wafer occurring, or performing frequency regulation which separated from the piezo-electric substrate wafer to each surface acoustic element, and repeated dry etching and frequency measurement separately anew after ****** in the container with products with the severe specification of a surface acoustic element, such as for example, an intermediate frequency filter, was also indispensable. Also in frequency regulation, the improvement was able to be aimed at so that frequency regulation could be carried out to real time by the very easy approach by serving with the already described SiO2 protective-coat formation.

[0010]

[Example] Hereafter, the example of this invention is explained according to an accompanying drawing. In addition, in each drawing, the same sign shall show the same object.

(Surface acoustic element) The top view of this invention is shown in drawing 1 . The electron beam 6 discharged from the electronic gun 34 is made to irradiate the solid quartz block 5 which is a source of vacuum evaporationo, SiO230 crawled off is vapor-deposited to homogeneity at the polar zone, even if there are few surface acoustic elements 2, and SiO2 protective coat 3 is formed in the front face of the surface acoustic element 2 constituted on the piezo-electric substrate 1 by carrying out cascade connection of the 1st horizontal joint surface acoustic element 20 and the 2nd horizontal joint surface acoustic element 21. By vapor-depositing on the front face of a surface acoustic element 2, SiO2 film 3 can protect the polar zone 7 which constitutes a surface acoustic element 2.

[0011] Moreover, in case [of the front face of a surface acoustic element 2] SiO2 protective coat 3 is vapor-deposited to the polar zone at least, frequency regulation of a surface acoustic element 2 can also be performed that it is simultaneous and easily by measuring the amount of SiO2 protection 3 film vacuum evaporationo by the frequency counter on real time.

[0012] Process drawing which displayed an example of the conventional process

which manufactures a surface acoustic element 2, and an example of the process of this invention on drawing 4 is shown. as being shown also in process drawing at the conventional process -- "SiO2 membrane formation [5.]" -> "FOTORISO (patternizing)" ->"7. probing" -> -- "-- 8. -- SiO2 protective coat 3 was formed in the state of f tone dry cleaning dirty" and the piezo-electric substrate wafer 4, and frequency regulation was performed by dry etching. [6.]

[0013] However, since the part which carries out bonding at the process of "wire bonding (W/B)" cannot vapor-deposit SiO2 protective coat 3 in advance as the background has already described by this conventional approach, [11.] The process which must attach SiO2 protective coat 3 except for a bonding part as shown in the top view of the piezo-electric substrate wafer 4 shown in drawing 2 and the partial enlarged drawing of the surface acoustic element 2 processed with photolithography on the piezo-electric substrate wafer 4 will be needed.

[0014] By this invention, all the processes to "SiO2 membrane formation [5.]" ->"6. FOTORISO (patternizing)" -> of the conventional process were able to be deleted as the "process of this invention" Fig. of drawing 4 showed.

[0015] At the former, processing processing of the process which was being processed by the surface acoustic element 2 of the condition of the piezo-electric substrate wafer 4 can be carried out by the surface acoustic element 2 separated separately. As shown in the process of this invention, 8. "individual f tone +SiO2 protective-coat membrane formation (formation)" of the assembly **** surface acoustic element 2 can be separately carried out at the process to "7. wire bonding (W/B)." In addition, about individual frequency regulation, frequency regulation of a surface acoustic element can also be performed by transposing the thickness of SiO2 protective coat 3 to a frequency, and managing on real time.

[0016] In addition, although SiO2 protective coat vapor-deposited on the surface of a surface acoustic element may vapor-deposit SiO2 protective coat to the whole surface acoustic element, even if it vapor-deposits SiO2 protective coat to the polar zone at least, it is a thing of a surface acoustic element from which the

same effectiveness is acquired.

[0017] (The manufacture approach of a surface acoustic element) Drawing 3 is the schematic diagram showing an example of the manufacture approach of this invention. Although it is the vacuum evaporationo approach according to the principle of the vacuum evaporationo machine used since an electrode is generally constituted in a piezoelectric transducer etc., the description is to store in the vacuum evaporationo crucible 33 the solid quartz block 5 which has a rolling mechanism, irradiate the electron beam 6 discharged from the electronic gun 34, and form SiO2 protective coat 3 by SiO230 crawled off. In addition, vacuum evaporationo processing is processed in the ambient atmosphere of a high vacuum.

[0018] The front face of a surface acoustic element 2 is turned caudad, the surface acoustic element 2 separately incorporated by the container 35 by the production process to 7. "wire bonding (W/B)" of "the process of this invention" which shows the surface acoustic element 2 which used photolithography and was formed on the piezo-electric substrate wafer 4 to drawing 4 is put on the vacuum evaporationo fixture 31, and SiO230 is vapor-deposited from a lower part toward the front face (SiO2 protective-coat 3 forming face) of a surface acoustic element 2. In addition, immediately under the surface acoustic element 2 by which SiO230 is vapor-deposited, even if there are few front faces of a surface acoustic element 2, the mask 32 is arranged so that SiO230 may be vapor-deposited by the polar zone.

[0019] SiO2 protective coat 3 stores the solid quartz block 5 in the crucible 33 which has a rolling mechanism, and is formed of SiO230 which flew soon depending on the electron beam 6 discharged from the electronic gun 34 emitted towards the solid quartz block 5.

[0020] The continuously fresh field is offered by the rolling mechanism of the crucible 33 in which the 5th page of the solid quartz block with which the electron beam 6 discharged from the electronic gun 34 is irradiated has a rolling mechanism.

[0021] On the other hand, the electronic gun 34 which is the generation source of a crucible 33 and an electron beam 6 which stores the solid quartz block 5 serves as a device which detached distance with a surface acoustic element 2 about 50cm, when taking into consideration SiO2 protective-coat 3 formation of a surface acoustic element 2, and the effect to the heat of the frequency regulation by the 3rd page of SiO2 protective coat, since it becomes an elevated temperature very much. The incidence of SiO230 in the mask 32 located immediately under surface acoustic element 2 because the crucible 33 which stores the solid quartz block 5, and a surface acoustic element 2 have distance of enough can be vapor-deposited almost perpendicularly to the vacuum evaporationo side of a surface acoustic element 2.

[0022] An electron beam 6 is irradiated at the solid quartz block 5, and although it has not indicated in drawing when the particle of SiO230 crawled off runs short of O2, it is the device equipped with O2 feed hopper as for which O2 supply is separately made to the vacuum evaporationo machine itself.

[0023] Vacuum evaporationo fixture 31 structure of holding a surface acoustic element 2 is applicable with the vacuum evaporationo machine of a turret method or an in-line method.

[0024]

[Effect of the Invention] Stabilization of drastic reduction of processes, quality, and precision and the improvement of the yield were able to be aimed at also to the manufacture correspondence of a surface acoustic element with a severe property specification by the ability of SiO2 protective-coat formation and frequency regulation for a surface acoustic element to be separately separated from the condition of a piezo-electric substrate wafer, and to be performed by this invention.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing having shown the top view of the surface acoustic element of this invention.
[Drawing 2] They are the top view of a piezo-electric substrate wafer, and the partial enlarged drawing of the surface acoustic element constituted on a piezo-electric substrate wafer.
[Drawing 3] It is the schematic diagram showing an example of the manufacture approach of this invention.
[Drawing 4] It is process drawing having shown an example of the conventional process, and an example of the process of this invention.
[Description of Notations]
1 Piezo-electric Substrate
2 Surface Acoustic Element
3 SiO2 Protective Coat
4 Piezo-electric Substrate Wafer
5 Solid Quartz Block
6 Electron Beam
7 Polar Zone

[Translation done.]

* NOTICES *

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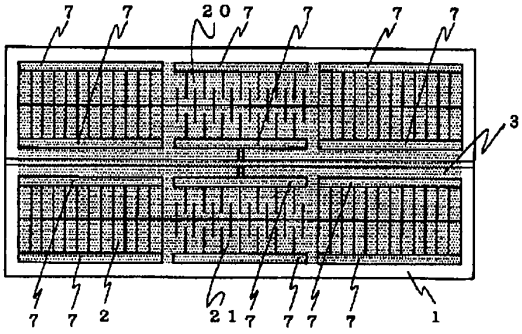
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

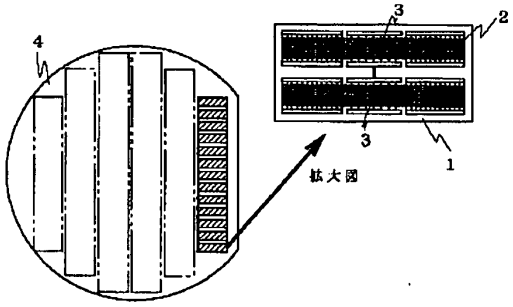
3.In the drawings, any words are not translated.

DRAWINGS

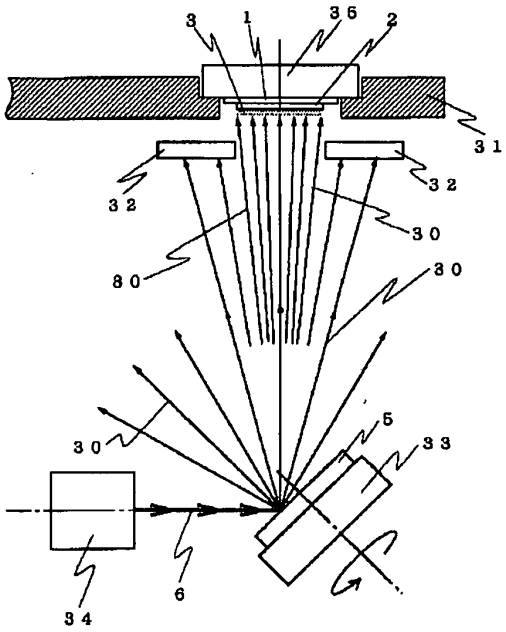
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]

従来の工程

1．ウエハー投入
↓
2．洗　浄
↓
3．電極形成成膜
↓
4．フォトリソ（電極形成）
↓
5．SiO_2成膜
↓
6．フォトリソ（パターン化）
↓
7．プロービング
↓
8．f調ドライエッチ
↓
9．ダイシング
↓
10．ダイスボンディング（D／B）
↓
11．ワイヤーボンディング（W／B）
↓
12．f調ドライエッチ
↓
13．封　止

本発明の工程

1．ウエハー投入
↓
2．洗　浄
↓
3．電極形成成膜
↓
4．フォトリソ（電極形成）
↓
5．ダイシング
↓
6．ダイスボンディング（D／B）
↓
7．ワイヤーボンディング（W／B）
↓
8．個別f調＋SiO_2保護膜成膜（形成）
↓
9．封　止

[Translation done.]

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21/316			21/316	Y	
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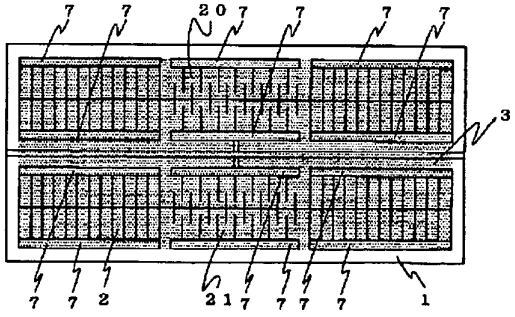
(54)【発明の名称】弾性表面波素子およびその製造方法

(57)【要約】

【目的】本発明の目的は、圧電基板ウエハから個々に切り離した弾性表面波素子単体の状態で、SiO_2保護膜を形成することで、弾性表面波素子の周波数調整工程の簡略化と製造工程全般における工程数の削減を行うことにある。

【構成】圧電基板ウエハ上にフォトリソ技術を用いて形成された弾性表面波素子を、ダイシング、ダイスボンディング、ワイヤーボンディングの工程を経て組み立てられた個々の弾性表面波素子の状態で、蒸着源に回転機構を有する固形石英ブロックを使用した電子ビーム照射方式の蒸着技術によって、弾性表面波素子表面の少なくとも電極部にSiO_2保護膜を均一に蒸着する。また、SiO_2保護膜を蒸着する際に、SiO_2保護膜の膜厚を周波数に置き換えてリアルタイムに管理することによって、弾性表面波素子の周波数調整も同時に行うことができる。



1

【特許請求の範囲】

【請求項１】圧電基板上に構成される弾性表面波素子の表面にＳｉO_2保護膜を形成する弾性表面波素子において、

蒸着ルツボの固形石英ブロックに電子ビームを照射し、ＳｉO_2保護膜を弾性表面波素子の表面に蒸着することにより所定の周波数に合わせ、かつ弾性表面波素子の少なくとも電極部にＳｉO_2保護膜が形成されていることを特徴とする弾性表面波素子。

【請求項２】該ＳｉO_2保護膜の保護膜蒸着厚みを加減することにより、リアルタイムに周波数調整を行うことを特徴とする特許請求の範囲第１項記載の弾性表面波素子。

【請求項３】圧電基板ウエハ上に、フォトリソ技術を用いて形成された弾性表面波素子のＳｉO_2保護膜を形成する弾性表面波素子に、電極を形成する工程と、該圧電基板ウエハから弾性表面波素子を個々に切断する工程と、容器にダイスボンディングしワイヤーボンディングする工程と、該電極上にＳｉO_2保護膜を周波数を監視しながら形成する工程から成る弾性表面波素子の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】弾性表面波素子の周波数調整とＳｉO_2保護膜形成に関する。

【０００２】

【従来の技術】従来技術では、圧電基板上に櫛形電極と反射器から構成される弾性表面波素子を、圧電基板ウエハの状態でＳｉO_2を蒸着し弾性表面波素子の電極保護膜を形成していた。また、周波数調整においても圧電基板ウエハ単位でおおよその調整を行った後、特性仕様に応じて圧電基板ウエハから弾性表面波素子を個々に切り離した段階で細かな周波数調整を行っていた。

【０００３】

【発明が解決しようとする課題】しかし、圧電基板ウエハの状態でＳｉO_2保護膜処理を施すと、その後の製造工程における弾性表面波素子内のワイヤーボンディング接続部分は、ＳｉO_2保護膜のために、ワイヤーボンディング処理ができなくなってしまう不具合が生じることから、ワイヤーボンデイング部分はＳｉO_2保護膜を行わないマスキングなどの工夫と手間が掛かってしまう。一方、周波数調整においては、圧電基板ウエハの状態でおおよその周波数調整を、ドライエッチング加工を用いてバッチ処理することで、周波数調整と周波数測定とがリアルタイムに行うことが困難で高価であった。また、ＳｉO_2保護膜の形成と周波数調整をそれぞれ別の工程で行う必要があり、多くの工程と時間と手間が必要なのが現状であった。

【０００４】

【課題を解決するための手段】固形石英ブロックに電子

2

ビームを照射させてＳｉO_2を蒸着することで、弾性表面波素子の少なくとも電極部にＳｉO_2保護膜を均一に蒸着することができる。弾性表面波素子を個々に切り離した段階で、個々に切り離された弾性表面波素子の少なくとも電極部にＳｉO_2保護膜を施すことにより、弾性表面波素子全面の電極保護膜を形成することができる。また、電極保護膜を形成すると同時に弾性表面波素子をリアルタイムで周波数調整が行うことができる。

【０００５】

【背景】ＳｉO_2によるＳｉO_2保護膜は、弾性表面波素子を構成する櫛形電極部分の交差指での異質物による電極間ショート等を保護する保護膜として施されるが、その保護膜処理には全体的な保護膜厚みなど良質なＳｉO_2保護膜が要求される。また、このＳｉO_2保護膜形成は作業性の難易性の問題から圧電基板ウエハの段階でバッチ処理されている。しかし、圧電基板ウエハの段階でＳｉO_2保護膜形成処理を行うことで、組立工程におけるワイヤーボンディング接続箇所を除いてＳｉO_2保護膜形成を行わなければならないという工夫と手間が必要になる。

【０００７】そこで本発明では、従来では圧電基板ウエハの状態でバッチ処理していたＳｉO_2保護膜形成を、ＳｉO_2保護膜形成のための蒸着方法を変えることにより、圧電基板ウエハの状態から個々の弾性表面波素子に切り離した状態で、容器に組み込んだ体裁の弾性表面波素子の少なくとも電極部（櫛形電極、反射器電極）にＳｉO_2保護膜を蒸着することにより工程の改善を行うものである。

【０００８】本発明で用いる蒸着手法は、回転するルツボに固形の石英ブロックを供給し、その固形石英ブロックに電子ビームを照射することにより、はじき飛ばされたＳｉO_2によって弾性表面波素子のＳｉO_2保護膜加工が行われる。従来の蒸着方法では、ルツボに供給される蒸着源が経時変化と共に蒸着源の組成が変化してしまうが、本発明の手法では、蒸着源の経時変化による組成変化が殆どなく、必要な時に必要な量だけを蒸着することができることから、蒸着されたＳｉO_2保護膜が極めて良質であるという利点がある。

【０００９】一方、周波数調整においても一般的には圧電基板ウエハ単位のドライエッチングでバッチ処理が行われていた。しかし、圧電基板ウエハ単位で周波数調整を行うと、圧電基板ウエハの中心部分と端部での周波数調整のバラツキが発生したり、例えば中間周波フィルタ等、弾性表面波素子の仕様の厳しい製品では、圧電基板ウエハから個々の弾性表面波素子に切り離し容器に組立た後、改めて個々にドライエッチングと周波数測定を繰り返した周波数調整を行うといった工程が必要不可欠でもあった。周波数調整においても、既に記述したＳｉO_2保護膜形成と兼ね合わせることで、大変安易な方法でリアルタイムに周波数調整が行えるよう改善が図れた。

【００１０】

【実施例】以下、添付図面に従ってこの発明の実施例を説明する。なお、各図において同一の符号は同様の対象を示すものとする。

（弾性表面波素子）図１に本発明の平面図を示す。圧電基板１上に第１の横結合弾性表面波素子２０と第２の横結合弾性表面波素子２１を縦続接続して構成される弾性表面波素子２の表面に、蒸着源である固形石英ブロック５に電子ガン３４から発射した電子ビーム６を照射させて、はじき飛ばされた$SiO_2$３０を弾性表面波素子２の少なくとも電極部に均一に蒸着し、SiO_2保護膜３を形成する。SiO_2膜３は弾性表面波素子２の表面に蒸着することにより、弾性表面波素子２を構成する電極部７を保護することができる。

【００１１】また、弾性表面波素子２の表面の少なくとも電極部にSiO_2保護膜３を蒸着する際、SiO_2保護３膜蒸着量をリアルタイムに周波数カウンタで計測することにより、弾性表面波素子２の周波数調整も同時に、かつ容易に行うことができる。

【００１２】図４に弾性表面波素子２を製造する従来の工程の一例と、本発明の工程の一例を表示した工程図を示す。従来の工程では、工程図にもある通り「５．SiO_2成膜」→「６．フォトリソ（パターン化）」→「７．プロービング」→「８．ｆ調ドライエッチ」と、圧電基板ウエハ４の状態でSiO_2保護膜３を形成し、ドライエッチングで周波数調整を行っていた。

【００１３】しかし、従来のこの方法では既に背景で記述しているように、「１１．ワイヤーボンディング（Ｗ／Ｂ）」の工程でボンディングする箇所はSiO_2保護膜３を事前に蒸着することができないため、図２に示す圧電基板ウエハ４の平面図と、圧電基板ウエハ４上にフォトリソ技術で加工された弾性表面波素子２の部分拡大図に示すようにボンディング箇所を除いてSiO_2保護膜３をつけなければならない工程が必要になってしまう。

【００１４】本発明により、図４の「本発明の工程」図で示すとおり、従来の工程の「５．SiO_2成膜」→「６．フォトリソ（パターン化）」→までの全ての工程を削除することができた。

【００１５】従来では圧電基板ウエハ４の状態の弾性表面波素子２で処理していた工程を、個々に切り離した弾性表面波素子２で処理加工することができる。本発明の工程に示す様に「７．ワイヤーボンディング（Ｗ／Ｂ）」までの工程で組立られた弾性表面波素子２を個々に「８．個別ｆ調＋SiO_2保護膜成膜（形成）」することができる。なお、個別周波数調整については、SiO_2保護膜３の膜厚を周波数に置き換えてリアルタイムに管理することによって、弾性表面波素子の周波数調整も行うことができる。

【００１６】なお、弾性表面波素子の表面に蒸着するSiO_2保護膜は、弾性表面波素子全体にSiO_2保護膜を蒸着しても良いが、弾性表面波素子の少なくとも電極部にSiO_2保護膜を蒸着しても同一の効果が得られるものである。

【００１７】（弾性表面波素子の製造方法）図３は本発明の製造方法の一例を示す概略図である。一般的に圧電振動子等に電極を構成するために用いられる蒸着機の原理に準じた蒸着方法ではあるが、蒸着ルツボ３３に回転機構を有する固形の石英ブロック５を格納し、電子ガン３４から発射した電子ビーム６を照射して、はじき飛ばされた$SiO_2$３０によってSiO_2保護膜３を形成することに特徴がある。なお、蒸着処理は高真空の雰囲気中で処理される。

【００１８】圧電基板ウエハ４上にフォトリソ技術を用いて形成された弾性表面波素子２を、図４に示す「本発明の工程」の「７．ワイヤーボンディング（Ｗ／Ｂ）」までの製造工程により個々に容器３５に組み込まれた弾性表面波素子２を、蒸着治具３１に弾性表面波素子２の表面を下方に向けて置き、弾性表面波素子２の表面（SiO_2保護膜３形成面）に向かって下方より$SiO_2$３０を蒸着する。なお、$SiO_2$３０が蒸着される弾性表面波素子２のすぐ下には、弾性表面波素子２の表面の少なくとも電極部に$SiO_2$３０が蒸着されるようマスク３２が配置されている。

【００１９】SiO_2保護膜３は、回転機構を有するルツボ３３に、固形の石英ブロック５を格納し、固形の石英ブロック５に向けて放射された電子ガン３４から発射した電子ビーム６によってはじき飛んだ$SiO_2$３０によって形成される。

【００２０】電子ガン３４から発射した電子ビーム６の照射される固形石英ブロック５面は、回転機構を有するルツボ３３の回転機構によって、絶えず新鮮な面が提供されている。

【００２１】一方、固形石英ブロック５を格納するルツボ３３と電子ビーム６の発生源である電子ガン３４は大変高温になるために、弾性表面波素子２のSiO_2保護膜３形成および、SiO_2保護膜３面による周波数調整の熱に対する影響を考慮する上で、弾性表面波素子２との距離を５０ｃｍ程度離した機構となっている。固形石英ブロック５を格納するルツボ３３と弾性表面波素子２とが十分距離があることで、弾性表面波素子２すぐ下に位置するマスク３２での$SiO_2$３０の入射は、弾性表面波素子２の蒸着面に対しほぼ垂直に蒸着することが可能である。

【００２２】固形石英ブロック５に電子ビーム６を照射し、はじき飛ばされた$SiO_2$３０の粒子にO_2が不足している場合には、図には記載していないが、蒸着機自体に別途O_2供給ができる様なO_2供給口を備えた機構となっている。

【００２３】弾性表面波素子２を保持する蒸着治具３１

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構造は、ターレット方式でも、インライン方式の蒸着機でも応用することができる。

【００２４】

【発明の効果】本発明により、弾性表面波素子を圧電基板ウエハの状態から個々に切り離して、SiO_2保護膜形成、周波数調整を行うことができることで、特性仕様の厳しい弾性表面波素子の製造対応にも、工程の大幅な削減、品質、精度の安定化、歩留まりの改善を図ることができた。

【図面の簡単な説明】

【図１】本発明の弾性表面波素子の平面図を示した図である。

【図２】圧電基板ウエハの平面図と圧電基板ウエハ上に

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構成される弾性表面波素子の部分拡大図である。

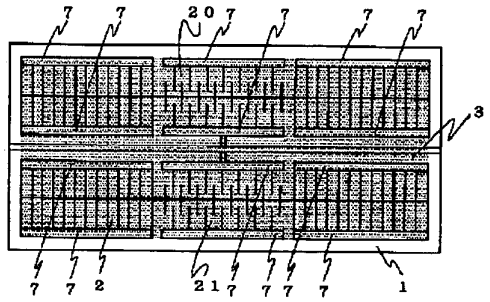
【図３】本発明の製造方法の一例を示す概略図である。

【図４】従来の工程の一例と、本発明の工程の一例を示した工程図である。

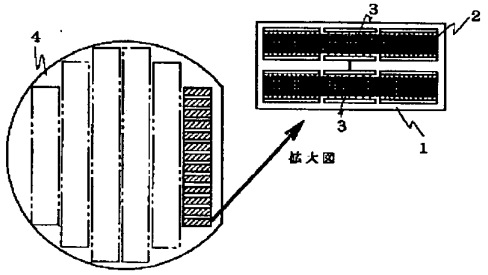
【符号の説明】

1　圧電基板
2　弾性表面波素子
3　SiO_2保護膜
4　圧電基板ウエハ
5　固形石英ブロック
6　電子ビーム
7　電極部

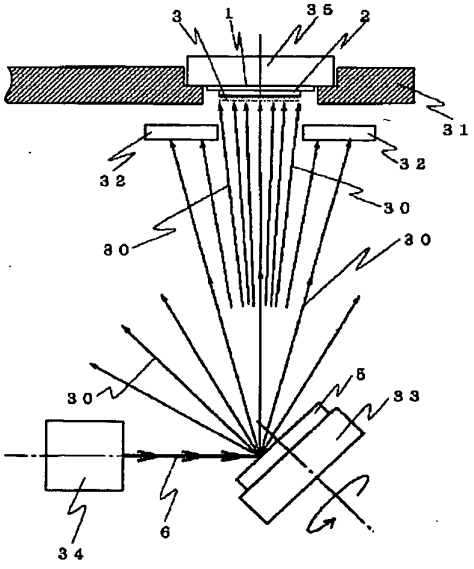
【図１】



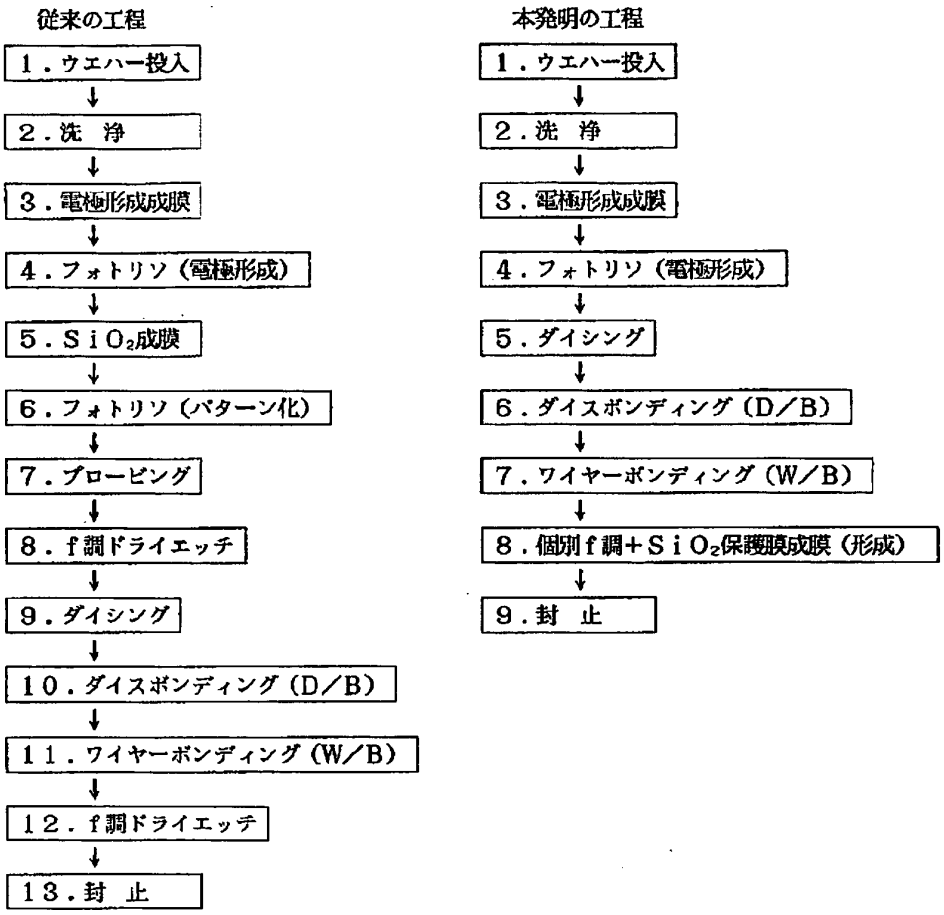
【図２】



【図３】



【図4】



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